6A: Watersheds/Water Quality

Questions & Answers

Q: Mark and Joann, you were looking at bio-available phosphorus and you were talking about total phosphorus so what's the relationship? If both of you could comment on that.

Grey: Well, total phosphorus is just that, total. BAP, biological available phosphorus is dissolved phosphorus which arbitrarily is defined as that which can be measured that passes through a 45 micron filter. And the other portion of BAP is particulate phosphorus that is labile, or a common term is easily mineralized. So then total P minus BAP would be a more resistant phosphorus that is mineral in nature or a highly stable organic P molecule.

Richey: And just to add a little something to that, the reason that in management that we model using total phosphorus is that the database that we have for bioavailable phosphorus is extremely limited. What we've done is try to correlate total phosphorus concentrations in the lake to the lake conditions that we're looking to preserve. So we know that some part of the total phosphorus fraction is not available biologically.

Q: Mark, the City of Bremerton applies biosolids to forested lands and there are a couple of questions I have. The first is with permitting agencies for when you do apply biosolids to areas where there's potential to impact surface waters, it looks, from your study, that nitrate is really what we want to look for in biosolids application.

Grey: Certainly.

Fohn: Yes, that was a very good point. And also I just want to comment that you picked some incredibly heavy rain events that you sampled. I noticed the December 96 event and the March 97 event. So you've really hit some big ones.

Grey: Right. And because of limited time, I picked those out from more than 15 total rainfall events that I analyzed. I just pulled those for representation. I was looking at my notes, I didn't mention: ammonia is very soluble, and if you are applying any type of fertilizer, ammonia is a good indicator if you're having any water quality contamination. That differs from nitrate, especially in biosolids over the long term, because nitrogen has to go through the mineralization step to get to nitrate, so ammonia is a good indicator of that. And those were very, very heavy rainfall events where old water that was stored in the watershed mixes with new water. But, as I said, what I showed was that, even though there was some relationship to flow increasing ammonia concentrations, those were still below pre application levels.

Fohn: Did you see the nitrates come off during the lesser storm events?

Grey: Post application? Yes, certainly.

Fohn: And did you test for fecal coliform?

Grey: Yes, early on I did. Fecal coliform is difficult in rainfall events because the holding time for fecal coliform is six hours, so it's very difficult to sample for in terms of a large run off event. But, in that January event, there were, I think, six determinations and they were all, most of them, were no detects and some of them had like six fecal units per 100 milliliters. So very low. It's difficult for that, unless you've got a direct conduit to the stream, I don't think you're going to see fecal run off from an application site.

Q: Joanna, you said you had some success for working with homeowners and other landowners on small lakes to reduce phosphorus loads. Could you outline what some of those efforts were and what actions they took?

Richey: The reason that I know this is the case is that we did the inevitable survey, We have small lake within the Lake Sammamish drainage basin called Beaver Lake. It's in the southeastern part of the drainage basin. Beaver Lake has a watershed that's totally, urban residential and it includes about 400 households. And it also is a phosphorus-limited lake and has a long history of management problems. We developed a nonpoint source management program for Beaver Lake a few years ago. That was done by Sharon Walton also at the King County Department of Natural Resources. And that lake, the people in that lake, voted to become a self-taxing district, or lake management district. And a major part of that management is to change their landscaping practices, to change the way they maintain their septic systems, to change to use of phosphorus in and around their gardens, their homes, their cars everything, pick up their pet waste, all the sources of phosphorus that come from residential development are being targeted by the lake management district. And they have done that essentially through a program, a multi-faceted program of education And, as you can imagine, before becoming a self-taxing district, a lot of education has to go on. so, they're not only changing their behavior, they are actually going to pay for the materials that are need to educated each other. What we did this past summer, and actually we're doing it again this summer, is we did a statistical survey asking people in the Beaver Lake management district and in the Lake Sammamish drainage many, many, many different questions about what they do in and around their homes, their daily activities, what their understanding of phosphorus pollution, lake limnology, nonpoint source control, etc. And interestingly enough, what we found is that the majority of residents in the Beaver Lake management district are extremely sophisticated and have actually changed their behavior in order to reduce the amount of phosphorus coming off their landscapes. We found that in the Lake Sammamish district most people had absolutely no idea what we were talking about. Seventy-five percent said, 'yes we know there is a pollution problem and we know it's caused by phosphorus.' However when we asked them specific questions bout what the activities that they did now and or activity changes they could make, they had absolutely no idea. That's given us a lot of information in terms of how education can really change people's behavior. That's why we're optimistic.

Q: Paul, it sounds like you may have made some assumptions about the source of the bacteria contaminants in the river. I'm wondering if you did any genetic work to see what those sources may have been or are?

Pickett: I didn't really make any assumptions about what the sources were. Initially with the study we just looked at where water was entering the river and sampling as many of those as we can. You can look at the land use and see what kind of land us exists in that basin and then, I guess in a sense, you might make some assumptions, at least about where to start looking.

We've looked into the genetic typing a little bit. There was the ribosomal RNA typing study in Pipers Creek and we've been talking to a researcher, whose name I can't think of at this moment. I don't think we really have a tool that's of practical use. The way I understand the current state of the art is that you can basically determine if a certain source is absent or present, so you can rule something out. But, if you find it, you don't know whether it's a tiny amount or most of it. There isn't a way to quantify it. That's my understanding of the current state of the art, although it would be nice to think that that could be improved because that could be a powerful tool.